# EXTENT TO WHICH MATHEMATICS PERFORMANCE IN KENYA CERTIFICATE OF PRIMARY EDUCATION PREDICT MATHEMATICS PERFORMANCE IN KENYA CERTIFICATE OF SECONDARY EDUCATION IN NYERI CENTRAL SUB COUNTY, KENYA.

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## DECLARATION

This is my original work and has not been presented for any academic award in any other University

Sign…… Date.....

Ndegwa Eunice Wairimu

E58/63947/2013

**Declaration by the supervisor**

This project proposal has been submitted for examination with my approval as the University supervisor.

Sign…… Date.....

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## DEDICATION

I dedicate this Research Project to the Creator, the Almighty God for His steadfast love and mercy that endures forever .To my dear husband Mark Gituku for his unswerving support in my academic endevours and children Brandon and Lindsay for their encouragement. To my dear parents Titus and Leah for taking me to school in my early childhood and supporting in the academic journey. To my in-laws who have always encouraged my husband to support me pursue higher education. May God bless you all.

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## ABSTRACT

This study sought to seek examine the extent to which Kenya certificate of primary education (KCPE) mathematics examination results can predict performance in mathematics at Kenya certificate of secondary education (KCSE) in Nyeri Central Sub county. The study was an ex-post facto type, in which descriptive survey design was adopted. The study had four research questions in which the researcher worked towards achieving. The objectives of the study were to; determine the predictive validity of performance in KCPE mathematics for the years 2008 to 2010 on their performance in KCSE mathematics over the period 2012 to 2014, identify how the skills and abilities are tested in mathematics at the KCPE and KCSE examination papers compare, find out gender differentiation in performance in mathematics and assess the attitudes of students towards mathematics.. The target population was eighteen public schools and seven private secondary schools. A sample of five secondary schools was selected at random using stratified random sampling to proportionately represent the boys, girls and mixed schools categories. Data was collected by analyzing syllabuses and performance records of both KCPE and KCSE, and use of questionnaires administered to teachers and students. Reliability of instruments was ascertained through pilot study while experts in the field of education from the University of Nairobi validated the instruments. Both qualitative and quantitative data was generated. Qualitative data was content analyzed while descriptive and inferential statistics were used to analyses quantitative data. KCPE predicts KCSE by 55.6%, skills and abilities tested reflect blooms taxonomy, recommended methods of teaching mathematics and are used in teaching mathematics in secondary schools apart from discovery method, and adequate assignments are provided but KCPE results are rarely used as bench mark. Differences occur in actual teaching methodology used at instructional level and marking. Performance of girls in mathematics is significantly lower than boys while attitude towards mathematics among students is slightly positive. However, majority of the students who dislike mathematics perceive it as difficult. The findings may be of help to the ministry of education especially in the ongoing curriculum reforms.

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| | |
|---|---|
| **CEMASTEA** | Centre for Mathematics and Technology Education in Africa |
| **KCPE** | Kenya Certificate of Primary Education |
| **KCSE** | Kenya Certificate of Secondary Education |
| **KNEC** | Kenya National Examination Council |
| **NACADA** | National Authority for the Campaign Against Alcohol and Drug Abuse |
| **RMAS** | Revised Mathematical Attitude Scale |
| **SMASE** | Strengthening of Mathematics and Science Education (Primary schools) |
| **SMASSE** | Strengthening of Mathematics and Science Education in Secondary Schools |
| **SPSS** | Statistical Package for Social Sciences |
| **WASC** | West African School Certificate |

# CHAPTER ONE

# INTRODUCTION

## 1.0 Introduction

This chapter presents a general introduction to the problem which includes; background of the study, statement of the problem, objectives of the study, research questions, significance of the study, assumptions, scope and limitations, conceptual framework and definition of terms.

## 1.1 Background to the Problem

Mathematics the world over plays a pivotal role in students' lives. It is a bridge to science, technology and other subjects offered in any formal education set up. Mathematics is probably the only subject that is taught in practically every school in the world. One of the cardinal reasons for the persistence of the special place held by mathematics in the school curriculum world over is the "way in which it has been used as a screening device or 'filter' for entry to numerous professions" (ICMI, 1986; P.11).

The teaching of mathematics concepts and skills the students encounter in schools shape their understanding, their ability to solve problems and the confidence in, and disposition towards mathematics, (Too, 2007). In Kenya, there seems to be a general consensus that every child must learn mathematics. This view is held because at both primary and secondary levels the subject is to be offered to all students as a compulsory subject. The education system is such that one takes high stakes examination after eight years primary education (KCPE) and after another four years of secondary education (KCSE). KCPE is used to select form one students to various cadres of secondary schools on the premise that their performance in KCPE will affect their performance in KCSE.

According to Daniel and Adeyemi (2010), a prediction of future examination result could be made with a reasonable success on the basis of the result of an earlier examination and that grades may serve as prediction measures and as criterion measures. Many times the poor results in KCSE have been blamed on the poor entry point or low marks scored in KCPE. KCPE results generally leads to placement of

students into their respective class of secondary schools. The concern of KCPE performance is heightened at least by some of the following reasons.

- One is the fact that the KCPE score determines the type of school the student will join namely National, County or District and each category has its status and performance index.
- The district schools having low performance are least favored ending up to be poorly equipped and mostly understaffed, (Kimani, 2005).
- The level of self esteem is more likely to be lowered due to labeling of some of the poor performing district schools thus limiting the students struggle to achieve better scores academically.

Adriaan (2008) posits that many of the performance problems at secondary school level have their roots from primary school level. The grade in mathematics obtained by a candidate at Kenya certificate of secondary education (KCSE) examination is one of the key considerations for admission to any university and other training institutions of higher learning. Essentially examinations are used as the main basis for judging students' ability and also a means for selection of educational advancement and employment. It is the quality of the grade that determines the career one ventures into life.

Due to the importance attached to mathematics in other fields of study like in sciences, economics, geography, business studies, and technical subjects and so on, and the fact that mathematics is compulsory at KCSE, selection to places is done with a pointer at the mathematics grade obtained at the Kenya certificate of secondary education (KCSE) examination. It is believed that the better the grade, say A or B the more chances are that a student will find it easy in learning other subjects where mathematics concepts are needed. Consequently the more chances are that the student will score a good grade in this subject at KCSE, the better for him or her and therefore the importance to carry out this study.

### 1.2 Statement of the Problem

The government budget allocation to education is quite enormous. Part of this money is used in the development and improvement of mathematics education in schools. However, there was little evidence to suggest that this increased expenditure on

education has any bearing on the performance in mathematics on the part of students at secondary level. The entry behavior of students into secondary schools as concerns mathematics requires a careful study of the mathematics grade of the student at KCPE. The study that was carried out in this research project was on how this mathematics grade at KCPE is viewed as a predictor to the grade obtained by the same student at KCSE examination.

### 1.3 Purpose of the Study

The purpose of this study was to investigate to what extent the KCPE mathematics grade is an effective predictor to the mathematics grade for the same student at KCSE level. This study will be carried out in Nyeri Town sub county secondary schools of Kenya including those for boys and those for girls. The researcher set out to bring to the fore the need to consider the grade in mathematics at KCPE and that at KCSE in the attempt to rationalize the predictive aspect.

### 1.4 Objectives of the Study

The specific objectives of the study were to:

i) Determine the predictive validity of performance in KCPE mathematics for the years 2008 to 2010 on their performance in KCSE mathematics over the period 2012 to 2014.
ii) Identify how the skills and abilities tested in mathematics at the KCPE and KCSE examination papers compare
iii) Find out gender differentiation in performance, in mathematics at KCSE among students in Nyeri Central Sub county secondary schools.
iv) Assess the attitudes of students in Nyeri Central sub county secondary schools towards mathematics as compared to their entry scores.

### 1.5 Research Questions

The following research questions guided the researcher in this study:

i) To what extent does the performance in mathematics at KCPE predict a student's performance in mathematics at KCSE?
ii) Which skills and abilities are tested in Mathematics at KCPE and KCSE levels?

iii) Is the performance of boys in mathematics at KCSE comparable to that of girls in Nyeri Central sub county secondary schools?

iv) What are the attitudes of students in Nyeri Central Sub county secondary schools towards mathematics?

### 1.6 Assumptions of the Study

In this study the following assumptions were made;

i) Nyeri Central Sub county secondary schools have adequate, qualified and experienced mathematics teachers.

ii) Physical facilities and learning resources are sufficient, adequate and properly utilized.

iii) Students are given proper and useful guidance into the nature of careers commensurate with the mathematics grade at KCSE.

iv) Nyeri Central Sub county schools select students from all parts of the country and therefore this research has a national representation.

v) KCPE and KCSE mathematics grades are a perfect match for the respective students under study.

vi) The qualities of instruction in Nyeri Central Sub county schools are at par with respect to caliber of staff, teaching strategies, learning resources and social facilities.

vii) KCPE and KCSE mathematics items have been set with equitable standards based on unchanging syllabuses.

### 1.7 Scope and Limitations of the Study

It is evident that there are several factors that influence students' performance in mathematics at secondary school level. This study was restricted to the performance of mathematics at KCSE as compared to the KCPE performance. It was also be restricted to Nyeri Central Sub county schools which may not be a true picture of National representation from which useful information would be gathered**.**

### 1.8 Significance of the Study

Mathematics is one of the many subjects in the school curriculum at both primary and secondary levels. Due to its varied application in other disciplines and future career

choices, there is greater pressure for students to succeed in it than in most other subjects. This usefulness however is perceived in different ways. It has a wide application in nearly every aspect of life. With this importance attributed to mathematics, it is disheartening to note that mathematics is one of the subjects that is performed extremely poorly by the students at KCSE examination (KNEC/KCSE Report, 2000). This has prompted the researcher to seek further evidence through this empirical study.

### 1.9 Justification of the Study

To many, mathematics is seen in terms of arithmetic skills which are needed for use at home, in the office, in small business enterprises workshops and in everyday life. This gives mathematics a wide range of application in nearly every aspect of life such as economics, commerce, accounting and advanced communication systems. However the extent to which the performance of mathematics in KCPE predicts the KCSE mathematics performance had not been studied in detail. This study of mathematics performance at KCSE in relation to the performance of the same student at KCPE examination sought to determine their relationship and also be of great value in the following aspects:

- To Kenya National Examination Council (KNEC) in providing feedback regarding to the predictive validity of KCSE and KCPE examinations with view to improving the quality of the examinations
- In providing feedback to schools and the ministry of education on mode of selection.
- On the adequacy of using multiple choice examination items at KCPE as compared to other types of examination formats.
- On the appropriateness of using KCSE results a basis for selection for further studies and training.

### 1.10 Conceptual Framework

The backward arrows indicate that some variables are net-mutually exclusive.

The performance of mathematics at KCSE level can be said to have a functional relationship with the following factors;

– Previous KCPE mathematics performance of students
– Nature of examination (skills and abilities tested)
– Gender perception
- Attitudes towards mathematics

**Independent Variables** **Dependent Variable**

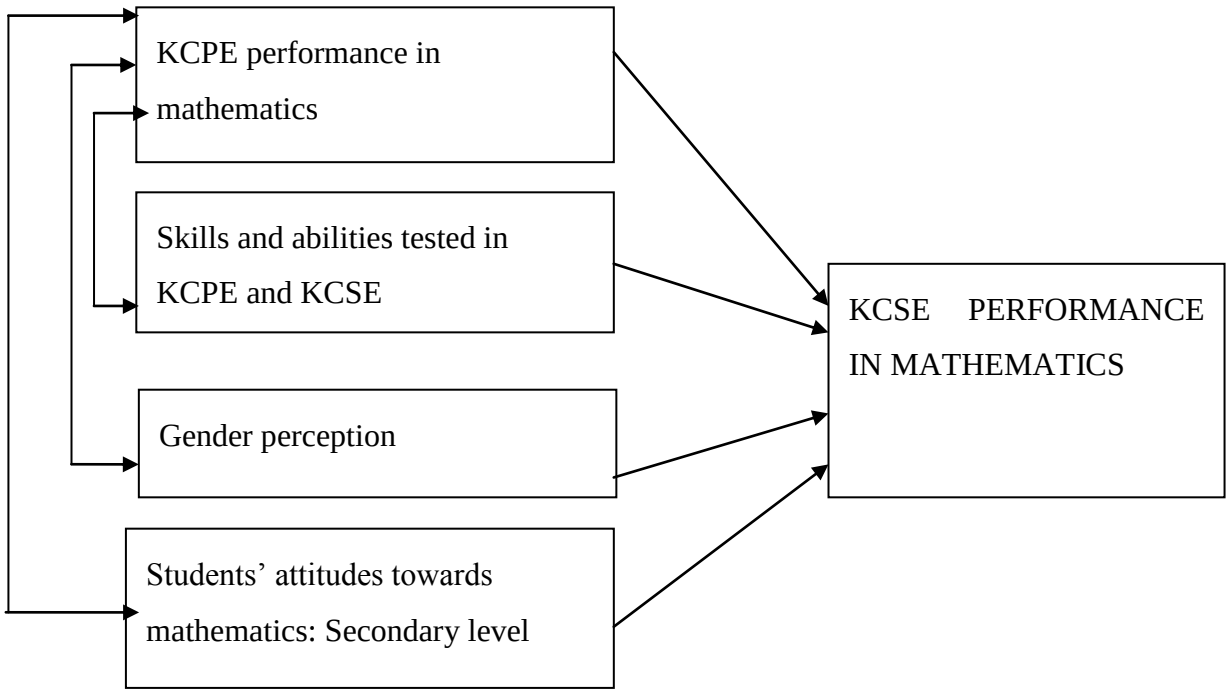


**Figure 1.1: Relationship among Variables**

### 1.11 Definition of Operation Terms

These are the variables, defined as used in this study.

**Performance in mathematics at KCPE level**

Attainment of pupils in mathematics after 8 years of primary education; this is defined as the independent ordinal variable. The values are measured in ordinal scale of performance grades namely:

A, A-, B+, B, B-, C+, C, C-, D+, D, D- and E

A is the highest attainable grade level and E is the lowest attainable grade level.

**Performance in mathematics at KCSE level**

Attainment of students in mathematics after 4 years of secondary education; in this study, this is the dependent ordinal variable. The values are measured in an ordinal scale of performance grades namely:

A, A-, B+, B, B-, C+, C, C-, D+, D, D- and E

The point system allocates 12 points to grade A and subsequently 1 point to E.

**Syllabus content**

In this study, the content skills at KCPE level are derived from the basic core topics in primary mathematics (See appendix III). This is regarded as nominal variable the content skills at KCSE level are derived from the core topics in primary mathematics with additional and upgraded content scope necessary for the students' progression in conformity with their maturation and abstraction.

The abilities tested at both KCPE and KCSE mathematics basically represent the intellectual abilities to cognitive domain (Bloom 1956) namely; Knowledge, comprehension, application, analysis, synthesis and evaluation.

**Gender of Students**

This represents the male and female categories in the study. It is defined as a nominal variable.

**Attitudes of students towards mathematics**

This represents the students' perception, interests and feelings towards mathematics. In this study, this variable is measured in ordinal likert scale.

**Nominal Definitions**

- Gutman's lambda correction coefficient (λ): A measure of correlation between nominal variables. In this study, it proves a measure of relationship between gender and performance (categories of performance grades).
- Kruskal's gamma coefficient (γ): used in this study to measure relationship between ordinal variables; mathematics performance grades at KCPE and KCSE levels. It also provides a measure of productive validity coefficient of correction between the two variables.
- Predictive validity coefficient; this is a measure of the extent to which the results of students' performance in a future similar or related subject performance measure. It is used in this study, therefore to determine how KCPE mathematics performance predicts KCSE mathematics performance for the same students.
- **Public schools:** These schools run and supported by use of public funds and include

- National schools: These are the best developed schools spread across the country, which admit students from all parts of the country. They normally consider students with better grades in KCPE. The schools are equipped with the best teachers, resources and they usually produce best results of KCSE examinations. It is only one in Nyeri Central Sub county
- County schools: these are the schools spread across the country but confined to admitting a greater percentage of students within the county.
- District Schools: These are schools developed through community effort and admit students who have average performance within the district.

**Private schools:** These are schools entirely sponsored by individual, groups or corporate

# CHAPTER TWO

# LITERATURE REVIEW

## 2.0 Introduction

This chapter reviews various studies done related to variables under investigation. It starts with background information on the predictive validity of mathematic performance, followed by the skills and abilities tested in mathematics, gender influence and performance and the students' attitude towards mathematics. The literature reviewed in this study emanates from various studies and works of educationists committed to the proper planning and continuity in the use of the available educational resources, Cockcroft (1982), points out that it would be very difficult, perhaps impossible to live a normal life without making use of mathematics of some kind. Mathematic is seen as a useful subject due to its provision of a powerful, concise, precise and unambiguous means of communication through graphs, tables, diagrams and symbolic representation to explain physical phenomena or make predictions (Mutunga and Breakel, 1987). Its study acts as an exemplification certainty. It is believed to possess the ability to keep development of reasoning power. It is taught in school and to all students because it teaches learners to think and display sharpness of mind.

Ominde Commission (1964) claimed that mathematics provides knowledge that would support people to become logical in thought and rational in decision making. However, over the years, performance in mathematics has continued to show a downward spiral. Various researchers have identified factors that are believed to cause poor performance (Moheso, 2012; Manoah et al. 2011; Benson, 2011, Mji and Makgato, 2006). This include, teachers not using students centered approaches, lack of experiments and practical modeling activities and lack of professional exposures that could have articulated issues related to teaching of mathematics in secondary schools. Many teachers attribute this performance to negative attitudes by the students as well as a missing link between primary and secondary school mathematics to lack of application of technology including computer use, lack of parental support, and lack of motivation by both teachers and students. Eshiwani (2001), points out that poor performance in Kenya is due to poor teaching methods, and an acute shortage of

textbooks. The fact that as many as six students share one text in some schools makes it impossible for them to complete their home work.

According to World Bank (2001), the first written public examination was introduced over 2000 years ago in China to select the most able citizens for positions in the civil service and to reduce the effects of patronage. The Chinese system was brought in Europe in the 16th century and the Jesuits incorporated the examinations in their schools. Prussians established an exam system for selection to civil service around the middle of 18th century, followed by France after the revolution. By the middle of 19th century, competitive examinations had been introduced in Britain and India to select the increasing number of government officials in the expanding empire.

**2.1 Predictive Validity**

Mathematics tends to be taught in a hierarchical way, Dowker, (2005). This means that children, who have missed or failed to learn earlier on, may have difficulty with late lessons based on attempts to build on earlier information. Tornoroos et.al, (2006) used hierarchical linear model to explore connection between self regulatory learning skills and students' performance in mathematics. They reported that interest itself was positively associated with students' result on the test. These arithmetic abilities seem to be important predictors to the development of mathematical proficiency. According to Koech (2008), Wasanga; Otieno (2007), there is a weak relationship between KCPE and KCSE performance. However, these findings have not reduced the pressure placed on secondary schools to perform relatively to their intake KCPE marks.

Sellinger (1994) alludes that there has been a general concern about the falling standards of numeracy raising the possibility of the need for a professional review of mathematics needed at various levels. Findings by Peer and Johnson (1994) confirmed the validity of the number and grades of passes in the Scottish certificate of education in predicting first year and final year university performance. Also, findings made by Gay (1996) in USA also confirmed the fact that high school grade could be used to predict college grades. Ubokobong (1993) and Itsuokor(1994), have also found that the GCE and secondary Certificate examination result have provided the best predict of university performance . In a study on "Predicting education performance at tertiary level on the basis of secondary level performance in Nigeria",

he found that the good and solid background of the student boosted their performance at the tertiary level of education.

In other development countries, the index of academic performance varied from one country to another. According to Hallack and Poisson (2007,) the main function of public examinations is to distribute educational benefits throughout the world on the ground that they can serve as instruments for making objective and neutral judgment. According to a study by World Bank (2005) learning assessments are crucial for measuring education quality and relevance, diagnosing system weaknesses and motivating policy reform. The ultimate goal of any human being is to achieve the objective set out for himself or herself in life, Alonge in Obioma ( 2007). Hence, achievement is central to our existence.

Adeyemi (2010) defined academic achievement as the scholastic standing of a student at a given moment. He refers to how individual is able to demonstrate his or her intellectual abilities. He therefore argued that a prediction of a future examination result could be made with reasonable success on the basis of the result of an earlier examination and that grades may serve as prediction measures and as criterion measures. As a measure of prediction, Adeyemi (2010) investigated the effects of intelligence quotient on academic achievement and found that achievement and scores increase as the intelligence quotient increased. Eysenck (1995) agreed with these findings and remarked that intelligence quotient testing has been extremely successful on the practical level predicting academic success from early child hood to university degree.

Akindehum (1993) found out those students entry qualifications are good predictors of their academic performance at the degree level. Ajogbeje (2011), reported positive correlation between scores of WASC, semester scores CGPA and GPA. However, Researchers have made divergent findings in the predictive validity of some examination, Majasan and Bakare in Kolewale (2007), found in their study that entry qualification has low predictive strength on the final academic performance of students at the university of Baden.In many countries in Africa, Asia, Latin America and Europe, public or external examinations have long occupied a central role in the assessment of individual students at the end of secondary schooling (Ross and Genevois, 2006). Public examinations according to Keeves (1994); Kellaghan and

Greaney, (1992); Kellagham and Madaus, (2003), serve a number of important functions:

i) They help control the different elements of education system by specifying goals and standards of education.
ii) Examinations are used to certify the achievement of students, providing evidence a student may need in the market place.
iii) Examinations are used to select students for further education in what is considered an objective and unbiased way in situations in which the number of student places diminishes at each level (Ross and Genevois, 2006).
iv) Examinations especially when results are published, may serve an accountability function for teachers and schools.
v) Finally examinations at the end of secondary schooling legitimize membership in international global society, and facilitate international mobility.

Among the government initiatives adopted in order to enhance the field of science and technology is strengthening of mathematics and science subjects in secondary schools (SMASSE) project which led to that of primary schools( SMASE). This is a joint venture between Japanese governments through the Japanese International Development Agency (JICA). It was established in 1998 to improve the capacity of young Kenyans in science and mathematics through in- training (INSETs) centers for mathematics and Technology Education in Africa (CEMASTEA). A consortium on strengthening mathematics and Science Education, 2009 labeled criticism against teachers for the declining standards in mathematic in the country. This poor performance is in both Kenya certificate of Primary Education (KCPE) and Kenya certificate of Secondary Education (KCSE).In Kenya, Othuon and Kisho (1994), found that the Certificate of Primary Education (CPE) scores had moderate positive linear relationship with Certificate of Secondary Education (CSE) grades with a correlation of 0.56 between them.

**2.2 Skills and Abilities**

In this study, the content skills at KCPE level are derived from the basic core topics in primary mathematics. This is regarded as nominal variable. The content skill at KCSE level are derived from the core topics in primary mathematics with additional and

upgraded content scope necessary for the students' progression in conformity with their maturation and abstraction. The abilities tested at both KCPE and KCSE mathematics basically represent the intellectual abilities to cognitive domain Bloom (1956) namely, knowledge, comprehension, application, analysis and evaluation.

With the current increase in scientific knowledge the world over, much demand is placed and emphasis is laid on the teacher, the learner and the environment in the whole process of teaching and learning mathematics. Schools are social organizations with defined rules and procedures that determine the degree of activities and behavior of each member (Mbithi, 1974). In Fillipino, research has shown that teachers prepare for a daunting task of teaching a beginning class in secondary school mathematics. In a study carried out by Fennema and Franke (1992), on pedagogical knowledge in mathematics, teachers' showed lack of correlation between teachers' content knowledge in mathematics and their students' success in mathematics. However what teaches do in the classroom, how they teach, how they make decision all have as much influence in their effectiveness as their content knowledge .

Yadar (2007) opines that no course in Science and mathematics can be considered as complete without including some practical work. The practical work ought to be carried out by individuals either in laboratories or in classes. At school level, practical work is even more important because of the fact that we learn by doing. Scientific practices and applications are thus rendered more meaningful. It is an established truth than an object handled impressed itself more firmly on the mind than the object merely seen from a distance or in an illustration. Thus practical work forms an important feature in any Science and mathematics course (UNESCO, 2008).

Certainly, the amount of mathematics content that teachers know affects their ability to respond to students' dilemmas involving the 'hows' and the 'whys' of learning mathematics. However, pedagogical knowledge in mathematics is that kind of knowledge that a teacher uses to deal with the everyday task of teaching and relating to students in the classroom. It is that kind of knowledge that teachers hope to improve when they say they want to become better teachers because they realize that this is where they draw all the ' tricks' that they can gather to make their students' learning experiences valuable (Opola, 2008). The learning of mathematics depends on the way it is presented to the learner, the way the learner actively interact with the

learning experience presented to him and the environment within which the learner takes place.

One of the most important functions of public national examination according to Wobmann (2005), is the measuring of education quality and relevance, diagnosing system weakness, and motivating policy reforms. In Kenya according to Munave, Ogutu and Wasanga(2008), national examinations have tended to define the style and intensity of teaching at school level. Currently 57% of the teachers in secondary schools spend most of their time preparing students to master test taking skills in order to pass KCSE examination papers as teaching resources in the classroom at least once a week. Time for teaching is misappropriated to testing and coaching. This is understandable, since passing with relatively better grades means a different future world for both the students and the teachers.

Students need to develop self regulatory learning skills. Within the framework of PISA (2003) self regulated learning skills are internal motivation (student's interest in enjoyment of mathematics) individual interest is an important prerequisite to attend to certain mathematical objects and activities ( Hodi & Ainley 2002; Koller' Baumert & Schriabel, 2001; Krapp, 2000; Schraw & Lehman, 2001). In interest driven activities, the activity is associated with favorable learning outcomes. Students experience competence and personal control, feelings of autonomy, by an experience of flow in which the students and the object of interest combine (Csikzentmihalyi & Schiofele, 1993).

Instrumental motivation being the motivation that comes from a source outside your self is characterized by the desire to engage in a learning process because it has positive outcomes (OECD, 2004). With instrumental motivation the purpose of mathematics attainment is more practical. Mathematics as a subject can be made practical and enjoyable if there are mathematics laboratories where some of the theories and theorems in the subject can be made practical. Students wants to learn mathematics because it will help them with the subject that they want to study further in school, they need it for what they want to undergo later or it will help them get a job.

Ellywood P.C characterized schools as a factory processing raw materials for social consumption. Hanson E.M (1979) emphasized that our school are in a sense, factories in which children are to be shaped and fashioned into products to meet the various demands of life. The specifications for manufacturing come from the policies laid down by the government. Education is universally recognized as a form of investment in human capital for economy benefits of the country. The teaching of mathematical concepts and skills the students encounter in school shapes their understanding, their ability to solve problems and their confidence in, and disposition towards mathematics (Too, 2007).

Secondary education is the level of basic education at which learners are expected to acquire proficiency in both academic and some applied subject. The students are expected to take a recognized national examination that will usher them to higher education at various fields of training or direct entry into the world of work (Koech, 2006). However, the current secondary school curriculum in Kenya is examination oriented with great emphasis laid on passing examination at the expense of acquisition of skills, values and attitude. According to Ross and Genevois (2006) many studies and official reports have pointed to the limitations of public examinations. Those include the fact that a very heavy reliance on paper and pencil tests limits the knowledge and skills that can be tested, and that examinations contain very little reference to the everyday life of the student outside the school.

Public exit examinations can provide performance information which can hold both schools and students accountable (Humushek, 2003) Students in countries with public exit examinations systems tend to systematically outperform students in countries without such system (Bishop, 1997; Bishop2006; Wobmann, 2005). In the two nations Canada and Germany where the existence of external examinations vary within the country because some region feature them and others don't, it has been similarly shown that students perform better in regions with external exams (Bishop, 1997; Jurges, Schneider and Buchel, 2005).

Mwangi (1986) commented that there had been an outcry from the government and the general public on the way students learn and perform in mathematics. Similar sentiments were expressed by Kiragu (1986), who noted that despite national efforts made in developing a curriculum that is appropriate to the needs of the country,

performance in KCSE in mathematics had been relatively poor over the past ten years. The late minister George Saitoti (in the East Africa Standard 2003 February 27), noted that the overall performance in mathematics and science subjects were below average. He emphasized that mathematics and science subjects were a necessity as two engine of development in Kenya and that the government was committed to the issue of performance.

Poor performance is as a result of teachers not being dedicated to their duties. Weak monitoring and assessment system remains major obstacles for improved learning outcomes at the secondary school level (Bregman and Stallmeister, 2002). Systematic and internationally comparable assessment of learning in secondary education at classroom, school, and system levels is not widespread , and considerable reliance has been placed on public examinations to ensure that the common curricula are covered (World Bank, 2001). The examinations then affect the content and the skills covered in school, and teachers gear their teaching to the examinations, which tend to encourage rote learning (Bregman and Stallmester, 2002).

### 2.3 How Gender Influence Performance in Mathematics at KCSE

Gender difference and achievement in mathematics have attracted the interest of a number of researchers in the recent past. Some studies showed that Female performs lower in mathematics and mathematics is a masculine subject which belongs to selected few. (Umoven and Ogbene, 2006; Kurumeh and Iji, 2009).Examining the roots of gender differences in learning may help find a solution to the problem that women are dramatically underrepresented in mathematics and science–based careers (Hyde and McKinley, 1996). One of the most common explanations for gender disparities in mathematics achievement has focused on attitude that students have towards mathematics. The causes of the gender difference are found to be multifaceted. Fidher and Rickards (1998), found that students perceived greater leadership and helping/friendly behavior in their teachers, and more negative in their classrooms where students perceived their teachers as admonishing and enforcing strict behaviors. Other researchers have compared the effect of separate (single- sex) and coeducational classrooms upon students' attitude (Norton and Rennie, 1998).

Vermeer et al., (2000), have further shown that the gender differences in self confidence were more marked for application problems those computation problems,

with girls showing significantly lower confidence for application problems. Despite such consistence findings of girls' low confidence in mathematics, studies of classroom environment has shown that the girls confidence in mathematics improved greatly in classes which actively involved girls in the learning of mathematics (Boaler, 2000). As far as differences in attitude development are concerned, girls have more positive attitudes towards mathematics than boys, but as they continue in mathematics, teachers need to facilitate positive attitude in girls towards mathematics (Swetman, 1995).

According to Desarrollo(2007), latin America, girls outperformed boys in languages by one – two percent points, but there was no gender difference in mathematics scores. The question of gender difference in academic performance in African Secondary schools is neither conclusive nor unanimous thus making it an essential things to carry out a research work on gender difference and achievement in mathematics. In Kenya girls have lower academic performance than boys, while in Mali there is no difference in performance between boys and girls (Barthes, Nair and Malpade, 2000). But according to Mensch and Lioyd (1997), studies in Nigeria and Thailand have shown a higher achievement for girls in single sex schools relative to mixed schools but lower achievement for boys when schools with similar resources are compared.

The developed countries are now worried over lower than girls' performance of boys, attributed to girls empowerment meaning their concern has shifted from girls to the underperforming boys. In Australia Wayne, Martino and Mills (2001), observe that there is a balance check on boys and girls after a period that emphasized girls' issues leading to boys' isolation. The concern for underperforming boys is recorded for United Kingdom and United State of America. In a study in Jordan female students were found to outperform males despite the stereotypic view that men are better performers than women (Kawalleh and Zaga 2009).

In developing countries like Kenya, Zimbabwe, Uganda and Nigeria the focus is mainly on girls who continued to perform poorer than boys. The academic performance disparity between boys and girls if allowed to continue would lead to imbalances in decision making and power sharing later in life. The concerns for performance between sexes do change in the society over time. The girls child is

marginalized and efforts to improve her self esteem, academic performance and participation in decision making is a major concern that is addressed through various ways in the society, mainly through education platform .

It is clear that attention to boys and girls need to be equal in emphasis otherwise it would lead to an imbalance situation where one gender has it at the expense of the other. In fact in some areas of the large Nyeri County, formally central province of Kenya the boy child is endangered more than girl child and measures need to be put in place to address issues like drug abuse and school absenteeism of boys (NACADA, 2010).The difference in performance across types of schools partly reflects differences in facilities, teachers and other resources, but it also reflects the different levels of academic preparation of the students admitted to these schools (Glennerster et.al..2011). Studies in performance in science and mathematics have been conducted widely as these subjects are considered of key importance to economic development of Kenya. Economic development is believed to heavily rely on science and technology advancement and mathematics is considered a science. Twoli (1998), observed that boys differed with girls on attitude, aspirations and achievement in science and mathematics but did not attribute the difference to any particular factors.

Liu and Wang (2005 found that female students were likely to seek and receive help from staff. Among the blind in Kenya, girls were found to have higher self esteem and perform better than boys Were, Indoshi and Yalo,(2010): Bailur, (2006), while Sunnetha and Mayurk (2001), found no significant difference in the performance of second year students in university between male and female. Ndirangu, Muola, Kithuka and Nassiuma( 2009) found that girls were more anxious than boys, but both genders were significantly anxious over who noted that girls on the whole had more incidences and intensity of anxiety than boys in academic anxiety .

'Elimu yetu' coalition (2003), registered the continued higher performance of boys over girls and that science subjects were poorly performed than Art subjects. Kurbanoglu, and Tukunyaci (2012), observed in their study that there were no statistically significant differences between students' gender and scores of attitudes towards mathematics lessons, but there were statistically significant differences between students, types of school. Students grades were also found to positively

correlate to scores of attitudes towards mathematics lessons, anxiety towards mathematics lessons and self-efficacy belies. The difference in gender exists in the way boys and girls respond to different classroom activities and learning experiences. Some studies reported significant difference in favor of male students by indicating that male students have higher mathematical reasoning ability or perform better than female students (Balogun, 1993; Araoye, 1991). Other studies reported no significant difference in mathematics achievement of male and female students (Shehu and Mari, 1997; Tapia and Marsh, 2004, Popola, 2008).

### 2.4 Students attitude towards Mathematics

Cockcroft (1982) noted that there's no area of knowledge where a teacher has more influence over attitude as well as understanding of his pupils than he does in mathematics. Cockcroft goes ahead to claim that during his professional life, a teacher of mathematics may influence for good the attitudes towards mathematics of several thousand young people and decisively affect many of their career choices. This indicates that teachers attitude towards mathematics has a great impact on mathematics performance than any other area of knowledge. Teachers' attitude towards the teaching of mathematics plays a significant role in shaping the attitude of students towards the learning of mathematics.

Teachers' attitude towards mathematics is a significant predictor of pupils' mathematics achievement as well as their attitude towards mathematics. Students' positive attitude towards mathematics could be enhanced by teachers' enthusiasms, resourcefulness and helpful behavior, teachers' thorough knowledge of the subject matter and their making mathematics quite interesting. It is on this premise that the attitude of the teacher, his/her disposition to the subject, students, and classroom environment could make or unmake the attitude of the students towards the learning of mathematics. The attitude of the mathematics teacher can mold the attitude of the students to want to learn or not. Hence the mathematics teacher should be psychologically prepared to teach the subject given that every other requirement is met.

According to Indimuli (1986), mathematics is one of the most useful subjects taught in schools and while most people, including parents' teachers and children appreciate the essential role of mathematics in everyday activities. It remains one of the most dislike and poorly performed subjects in the county. Statistics released by the Southern and Eastern Africa Consortium for Monitoring Education Quality (SACMEG, 2011) reported that learning achievement in Kenya's public schools has steadily dropped since introduction of free primary education. Trends in pupils achievement in mathematics also indicate in the last ten years, there had been a marginal drop in average scores among Kenya pupils.

In a study carried out by Waihenya (2000), teachers' attitude was blamed for failure in mathematics and sciences. One student is quoted saying that teachers identify those who like the subject and concentrate their efforts on them. They never try to change the perception of students who had negative attitude towards mathematics and who eventually fail. The teachers were also accused of not marking the books of the week students and not punishing those who missed the lessons, which was like" institutionalizing" the students' dislike of the subject. Ryan and cooper (1984) affirm the same when they talk of situations where teachers dislike particular students while having obvious fondness for others.

Wando (1992) studies teachers as a possible source of pupils' attitude towards mathematics. She found no evidence to the effect that teachers' attitudes affect pupils towards the subject. Kinyanjui (2004), argues that there is no significant relationship between the mathematics teachers attitude and students performance in the subject, whereas Margaret (2003), contradicts to conclude that a significant relationship does exist between attitudes of teachers and learners performance.

Self concept in mathematics contributes highly to the attitude of an individual towards this subject. It is defined as self perceptions about one's abilities and the competences that influence the possibilities of success in mathematics (Byrne & Shavelson, 1986). Students with a positive self concept show more motivated behaviour and greater persistence with challenging task (Stipek, 1998). Self concept is viewed as a self explanatory variable for students varying performance in school. However, other reasons insist that self concept is consequence and not a cause of students' achievements (Bong & Clark, 1999).

The government of Kenya and Japan jointly initiated SMASSE / SMASE INSET program since 2004 with the aim of changing teachers' attitude and teaching approaches of science and mathematics which was expected to translate into changing students' attitude hence improving their academic achievements. Teachers attitude towards the teaching of mathematics plays a significant role in shaping the attitude of students towards the learning of mathematics. Here teachers' and students' attitude is significant and can be used to predict students' performance in mathematics. Teachers' cannot be dissociated from the schools they teach and academic results of their schools. They play a crucial role in educational attainment because the teacher is ultimately responsible for translating policy into action. According to Onocha(1985), Miji and Makgato (2006), Chiriswa (2003), and Yeya (2002), teachers' attitude towards science and mathematics is a significant predictor of pupils' science and mathematics achievement.

Students' positive attitude towards mathematics could be enhanced by teachers' enthusiasm, resourcefulness and helpful behavior, and teachers' thorough knowledge of the subject matter (Orado, 2008; Oguniyi(1982). Teachers are said to be effective only when their teaching can lead to students' learning. Nothing has been taught until it has been learnt. It is therefore important that the teacher must see teaching as an attempt on his own part to transfer what he has learnt to his students.

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1 Overview

This chapter deals with methods and procedures used to collect data for the study. It covers the research design to be used, location of the study, target population, sampling techniques and sample size, instrumentations, recruitment of research assistant, inclusion and exclusion criteria, pilot study, data collection procedures and data analysis.

## 3.2 Research Design

According to Orodho (2004), research design is a scheme or plan that is used to generate answers to research problems. Kothari (2004) defines it as the blue print for the collection, measurement and analysis of data. The researcher adopted the survey design which incorporated both descriptive and correlational research. This method was considered based on the nature of the study and the objectives previously stated. In order to establish the relationship between KCPE mathematics performance and KCSE mathematics performance, correlation research was deemed appropriate. To investigate the students' attitudes, descriptive study was used.

## 3.3 Target Population

According to Mugenda and Mugenda (1999), target population or universe of a study is defined as all the members of real or hypothetical set of people, events or objects to which an investigator wishes to generalize the results of the study. The target population of the study was 20 secondary schools in Nyeri Town Sub county of Nyeri County .The population comprised of a National school, Private school, mixed public day secondary school, girls' only secondary school and boys' only secondary school. In total there were five schools of different calibers.

## 3.4 Sampling Procedure

The researcher used stratified random sampling technique since the population from which sample size was drawn from public, private, day mixed, girls or boys' schools. The stratified sampling process involved necessitated the production of typical

representative sample of the entire stratified population which guaranteed representativeness reducing sample error as well as have more statistical precision.

### 3.5 Sample Size

A sample is a sub-set of the total population that is used to give the general views of the target population (Spata, 2003).The sample size must be a representative of the population on which the researcher would wish to generalize the research findings. A sample size of twenty percent combining both public and private schools was reliable for the study. According to Kothari (2004), a sample size of 20% is an adequate representative of the entire population. For Nyeri Central Sub-county which has a total of twenty five secondary schools, this amounts to five secondary schools. In order to accord each of the potential schools in the population equal chances of inclusion, the researcher assigned each school a number except for the National school which is the only one in the area of this study. The numbers for each category was written on small pieces of paper and folded. The papers were then be dropped into different containers for private schools, mixed day, Girls only and Boys only secondary schools. The researcher then picked randomly one paper from each category of schools' stratum making a total of stratified sample size of five schools which constituted the sample population under investigation. Students interviewed from the chosen schools were also selected using stratified random sampling method. Twenty percent of the form three students in each school were interviewed on attitude towards mathematics. From the five schools in the sample, performance data on KCPE and subsequent KCSE mathematics examination was obtained from 20% of the former students.

### 3.6 Inclusion Criteria

Selected students present in the selected schools and only those who had consented to participate by signing the consent form were included.

### 3.7 Exclusion Criteria

Selected students absent or declined to sign the consent to participate were excluded.

### 3.8 Recruitment and Training of Research Assistants

One research assistant was recruited and trained on how to note down the student

grades as contained in the KCSE examination lists as well as the students' KCPE grade from entry point records.

### 3.9 Data Collection Procedure

The study covered the KCPE examination of 2008 to 2010 and the results for candidates enrolled and completing KCSE in the selected schools in the years 2012 to 2014. Results were summarized for each cohort of secondary classes among their attainment and compared to their earlier achievements in KCPE. The respective KCPE and KCSE syllabus was analyzed to establish content, skills and abilities taught and tested, while predictive validity was determined by analyzing KCPE and KCSE examination results of the selected years. Questionnaires were administered and carried out with form three students to establish their attitude towards mathematics. They were also required to provide useful information on how they learn mathematics.

### 3.10 Data Collection Instruments

Data from the sampled students from each school was be collected by use of precise questionnaires. These instruments were basically targeting the attitudes of students towards mathematics. There were also structural questionnaires with open and closed ended questions to produce quick and easy quantitative and qualitative data.

#### 3.10.1 Questionnaire

Two sets of questionnaire were constructed guided by the formulated research objectives. They were administered by the researcher and the assistant to the sampled schools for students and teachers to elicit information on the independent and dependent variables under investigation. It was important to use this type of instrument to this group of people since they could read, understand and respond to the questions by writing their responses without undue influence. It was also a very useful tool for collecting data due to anonymity of the respondents thus upholding honesty and free expression. The questionnaires were composed of closed -ended questions and open- ended questions. Closed-ended questions were largely because they were easy to administer, analyze and time saving. The open-ended questions enabled the researcher to understand the respondents at depth for it gave them an opportunity to express their feelings by giving more information freely. The

questionnaires for the teachers composed items seeking demographic information as well as skills and abilities tested in KCSE and KCPE. Questionnaire for students provided for demographic information and attitude scale intended to measure the attitude of learners towards the learning of mathematics. The test had matrix questions with 5 choices each. Respondent were expected to pick one possibility from each statement. The possibilities and the corresponding scores awarded were in accordance to Revised Mathematical Attitude Scale (RMAS). A five rating Likert scale whereby statements was awarded as follows: strongly agree-5, agree-4, undecided-3, disagree-2 and strongly disagree-1. The highest score respondents could attain is 100 and the lowest being 20. To get the average score, the highest score was added to the lowest score then divided by two:

Average = (Highest Score + Lowest Score) ÷ 2

= (100+20) ÷ 2 =60

Thus, scores were categorized according to numerical rating from the smallest number to the biggest number as follows: Negative attitude……20-39, slightly positive……..60-79, slightly Negative……..40-59, Positive……..80-100.

### 3.10.2 Document Analysis

Syllabuses of both KCSE and KCSE were examined to obtain similarities and differences in the curriculum instruction. Further, performance records of students who sat in KCPE and in 2008-2010 and how they scored in KCSE 2012-2014 was examined. Data was used to outline differences and similarities in curriculum instruction as well as examining predictive validity.

## 3.11 Validity of Instruments

Validity is the degree to which results obtained from the analysis of the data actually represent the phenomenon under study (Orodho, 2005). It is the accuracy and meaningfulness of inferences, which are based on the research results (Mugenda and Mugenda, 1999). Therefore, an instrument is said to be varied when it actually measure what it claims to measure. To establish instrument validity of the two instruments, the researcher was careful when constructing the items by ensuring they embrace all the research objectives. As recommended by Mugenda and Mugenda (1999), the researcher used experts and professionals in the field of education to

establish content validity of the two instruments and their judgment was used to review the items in the questions.

### 3.12 Reliability of Instruments

Mugenda and Mugenda (1999), define reliability of the research instrument as its level of internal consistency over time. A reliable instrument therefore is the one that constantly produces the expected results when used more than once to collect data from two samples drawn from the same population. To establish the reliability of the instruments therefore, a pilot study in two schools within the sub county was carried out. These schools were selected from the study population. The procedure used in pre-testing was identical to that used during the actual.

### 3.13 Data Analysis

Qualitative and quantitative data was summarized organized and presented using tables of frequencies and percentages. Pearson correlation and regression was used to examine predictive validity of KCPE in the performance of KCSE, while t- test was used to examine gender differences in performance of mathematics

### 3.14 Ethical Issues and their Considerations

According to Rukwaru (2007), ethics refers to a set of rules and regulations that guide conduct of a profession. This research was conducted while strictly adhering to University of Nairobi set of guidelines for masters' degree in education. Consent to do research was sought from National Commission for Science Technology and Innovation as well as participants who were fully briefed on purpose of the research. The privacy and confidentiality of the participants, objectivity in data interpretation, honesty in carrying out the research and acknowledging the sources of information were considered in this study.

# CHAPTER FOUR

# DATA PRESETATION, ANALYSIS, INTERPRETATION

## 4.1 Introduction

This chapter outlines the questionnaire return rate, demographic characteristics of the respondents as well as the findings of the study that sought to establish the predictive validity of KCPE in the performance of KCSE. This study was guided by the following specific objectives;

i) To determine the predictive validity of performance in KCPE mathematics for the years 2008 to 2010 on their performance in KCSE mathematics over the period 2012 to 2014.

ii) To identify how the skills and abilities tested in mathematics at the KCPE and KCSE examination papers compare

iii) To find out gender differentiation in performance in mathematics at KCSE among students in Nyeri Central Sub county secondary schools.

iv) To assess the attitudes of students in Nyeri Central sub county secondary schools towards mathematics as compared to their entry scores.

## 4.2 Demographic Background of Respondents

### 4.2.1 Demographic Background of Students

Figure 4.1 shows the gender of student respondents from sampled schools on gender

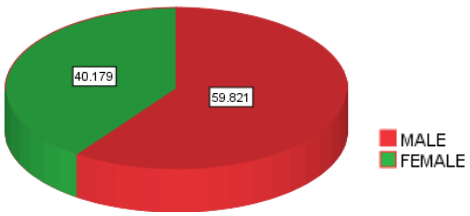


**Figure 4.1 Genders of Respondents**

The results show that the girls were 40.179% while the boys were 59.821%. The higher number of boys respondents is because Nyeri Central Sub County has one girls' school while the rest are mixed and boys' schools.

Figure 4.2 shows the age of students sampled.

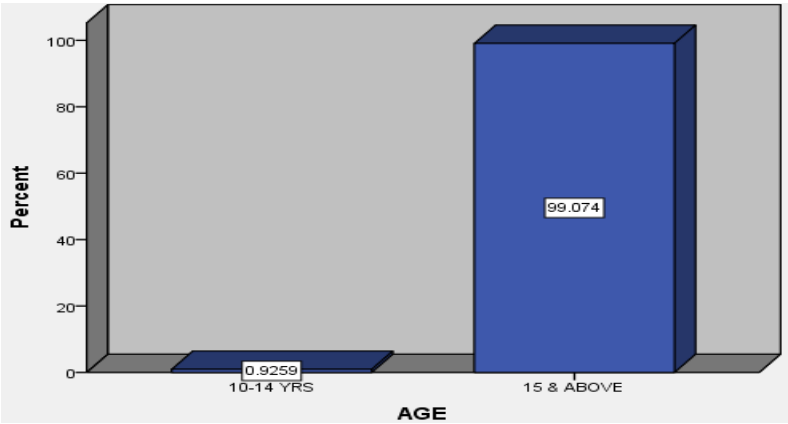


**Figure 4.2: Age of Respondents**

About 99% of students are aged 15 and above while about 1% are below 15 years. The form 3 students targeted for the study are likely to be 15 years and above

### 4.2.2 Demographic Background of Teachers

Table 4.1 shows the demographic background of teachers. Analysis show that 50% of respondents are between the age of 21-35, 45.8 % between 36-50 and 4.2% between 51 and 60 years, mathematics teachers to close the staffing that have been wider over the years (MOE, 2005). The youthful mathematics teacher population is expected to be energetic in teaching the subject.

On Gender analysis, males are 62.5% while females are 37.5%. Mathematics remains as a dominance for females. Despite notable achievements of women in graduation in higher education science careers are still dominated by men. Onsongo (2009) argues that quantitative achievements in women enrolment in higher education has not been resonated on quality of courses they pursue.

Teacher qualifications indicate that 66.7% are Bachelor of Education holders, while 16.7% diploma and 16.7% Bsc/ BA holders. Thus most teachers have requisite qualifications for teaching mathematics. Qualified teachers easily overcome teaching methodology challenges, which can predict performance in mathematics. Moreover,

higher education not only enriches one's knowledge but also reinforces a teacher's confidence, exposing him/her to various teaching pedagogies and/or strategies (Bunyi, et al, 2011).

**Table 4.1: Demographic Characteristics of Teachers**

| **Demographic characteristics of teachers** | | **Frequency** | **Percent (%)** |
|---|---|---|---|
| Age of teachers | 21-35 years | 12 | 50.0 |
| | 36-50 years | 11 | 45.8 |
| | 51-60 years | 1 | 4.2 |
| Gender | Male | 15 | 62.5 |
| | Female | 9 | 37.5 |
| Teachers qualifications | B/ed | 16 | 66.7 |
| | Bsc/BA | 4 | 16.7 |
| | Diploma | 4 | 16.7 |
| Teaching experience in years | Over 12 | 3 | 12.5 |
| | 8-11 | 7 | 45.8 |
| | 3-7 | 11 | 29.1 |
| | 0-2 | 3 | 12.5 |
| Work load per week(lessons) | 15-22 | 5 | 20.8 |
| | 23-27 | 17 | 70.8 |
| | 28 | 2 | 8.3 |
| Teaching other subjects | Yes | 20 | 83.3 |
| | No | 4 | 16.7 |
| Other subjects | Physics | 7 | 31.8 |
| | Biology | 2 | 9.1 |
| | Chemistry | 5 | 22.7 |
| | Geography | 2 | 9.1 |
| | Others | 6 | 27.3 |

The analysis also show that teachers experience in years ranges from over 12 and 0-2 (12.5%), 3-7 (29.1%) and 8-11 (45.8%). The teaching experience of between 3-7 and 8-11 years where majority of teachers fall can be explained by the larger population of youthful teachers who have been recruited. Experience improves mastery of mathematic concepts critical to effective instruction (enables the teachers to acquire certain commendable characteristics such as promptness, adaptability, efficiency, arousing and maintaining learners' interest, command of instructional materials and ability to face the class with confidence (Kosgey, 2013).

Analysis of background information also reveals the distribution workload for teachers. The workload per week in terms of number of lessons is; 28 (8.3%), 23-27 (70.8%), 15-22 (20.8%). Moreover, (31.8%) teach physics, 22.7% teach chemistry while 9.1% teach Biology and Geography. Majority of teachers have reasonable workload as recommended by TSC. Schools in urban areas have often reasonable of areas considering that Nyeri Sub county is largely urban. Therefore, teachers are expected to teach more effectively.

### 4.3 Predictive Validity of Performance in KCPE Mathematics on the Performance in KCSE Mathematics

The first objective sought to determine the predictive validity of performance in KCPE mathematics for the years 2008 to 2010 on their performance in KCSE mathematics over the period 2012 to 2014. Means and standard deviation, paired t test, pearson correlation and linear regression were used. Means in KCPE performance for the period 2008 to 2010 and respective performance 2012 -2014 were calculated as shown in Table 4.2

**Table 4.2: Means and Standard Deviation of KCPE (2008-2010) and KCSE (2012-2014)**

| | Mean | N | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|
| **KCPE** | 9.70 | 219 | 3.130 | .212 |
| **KCSE** | 10.05 | 219 | 3.088 | .209 |

Results shows that mean differences occur in the performance at 9.7 in KCPE and 10.05 in KCSE. Students performed better in KCSE than in KCPE. Further analysis was done using paired t-test at 0.05 Confidence level to assess whether the means were significantly different. The findings are presented in table 4.3

**Table 4.3: Paired Sample t-test**

**Paired Samples Test**

| | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference Lower | Upper | | | |
| Pair 1 kcpe - kcse | -.356 | 2.212 | .149 | -.651 | -.062 | -2.383 | 218 | .018 |

Analysis of results indicates that mean differences are significant at 0.05 confidence level as p value is less than 0.05 ($p < 0.05$). Further analysis was done to examine nature of relationship between performances in KCPE mathematics and KCSE mathematics. The findings are represented in table 4.4

**Table 4.4: Correlation between KCPE and KCSE Performance in Mathematics**

| | | **KCPE** | **KCSE** |
|---|---|---|---|
| KCPE | Pearson Correlation | 1 | .747** |
| | Sig. (2-tailed) | | .000 |
| | N | 236 | 219 |

** Correlation is significant at the 0.01 level (2-tailed).

The findings show a significant (p=000) strong and positive correlation (.747) between KCPE and KCSE performance in mathematics. The findings contrast the findings of Koech (2008) and Wasanga and Otieno (2007) who reported a weak relationship between KCPE and KCSE performance in Mathematics. Perhaps efforts to link up mathematics concepts taught in primary and secondary school through SMASSE programmes have improved the situation. Effective mathematics instruction

involves building of concepts in which entry behavior is paramount (CEMASTEA, 2008).

More analysis was done to examine the extent to which KCPE mathematics performance predicts KCSE mathematics performance using linear regression. The findings are represented in the tables 4.5 and 4.6

**Table 4.5 Regression Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .747[a] | .558 | .556 | 2.057 |

a. Predictors: (Constant), KCPE

Analysis of results points out that the adjusted R2 value of 0.556 indicates that KCPE mathematics performance predicts 55.6% of KCSE mathematics performance. The remaining 44.4 percent is caused by other factors not considered in this study. Further analysis was done to examine whether R value occurred due to chance (Table, 4.6).

**Table 4.6: Summary ANOVA Table**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| | **Regression** | 1160.716 | 1 | 1160.716 | 274.187 | .000 |
| | **Residual** | 918.626 | 217 | 4.233 | | |
| | **Total** | 2079.342 | 218 | | | |

a. Dependent Variable: KCSE

b. Predictors: (Constant), KCPE

The findings indicate that F-ratio of the regression analysis is significant (F (1)217) = 4.233: $p<0.05$). This shows that the R value is not due to chance. Predictive ability of entry behavior on performance at higher levels has been corroborated by other authors. Findings by Peer and Johnson (1994) confirmed the validity of the number and grades of passes in the Scottish certificate of education in predicting first year and

final year university performance. Similarly, Ubokobong (1993) and Itsuokor (1994), have also found that the GCE and secondary Certificate examination result have provided the best predict of university performance. The predictive ability of KCPE mathematics performance in KCSE mathematics performance of 55.6% is close to overall KCPE prediction of 55.9% espoused by Jagero (2013).The findings indicate the importance of acquiring basic arithmetic skills. The basics acquired in primary mathematics are important in understanding concepts. Dowker (2005) points out that mathematics is best taught in a hierarchical manner which means that Mathematics tends to be taught in a hierarchical way. This means that children, who have missed or failed to learn earlier on, may have difficulty with late lessons based on attempts to build on earlier information. Conversely, students who get mathematical concepts at primary level are better placed to understand the concepts at secondary level especially when appropriate link is established.

### 4.4 Comparison of Skills and Abilities tested in Mathematics at the KCPE and KCSE

The second objective sought to examine skills and abilities tested in KCPE and KCSE mathematics. Data was obtained from review of syllabus and a questionnaire administered to the teachers. Review of syllabus indicate that both mathematic curriculum capture blooms taxonomy; knowledge, comprehension application, analysis and application. Moreover, the content skill at KCSE level are derived from the core topics in primary mathematics with additional and upgraded content scope necessary for the students' progression in conformity with their maturation and abstraction. Both syllabuses constitute teaching and learning activities which include exercises, projects and instructional demonstrations and problem solving. However, when teachers were asked to compare the differences between KCPE and KCSE (Table 4.7) Majority differences occur in marking (39%) and methods of teaching (39%).

**Table 4.7: Differences between KCPE & KCSE Mathematics Instruction**

| | | Frequency | Percentage |
|---|---|---|---|
| **Difference between KCPE & KCSE instruction** | **Methods of teaching** | 9 | 39.1 |
| | **Nature of marking** | 9 | 39.1 |
| | **Student task** | 3 | 13.0 |

In secondary mathematics marking is based on workings while at primary level multiple choices which can predict the method of teaching. Ndiku et al (2012) point out one the drawbacks in teaching primary mathematics is use of choice questions which may influence the teacher or even the students to ignore key concepts so long it is possible to arrive at the answer. Ondima et al (2013) argues that the difference in method of assessing KCPE and KCSE is one of the missing links that contribute to lower relationship in performance. On similar vein Obwoge (2013) explains that competitive examination system compromises appropriate teaching methodologies especially in primary schools. Consequently, concepts especially in mathematics may hardly be solidified.

Teachers were also asked about their opinion on teaching methods. Teachers in secondary schools use variety of recommended methods of teaching (Table 4.8).

**Table 4.8: Methods of Teaching Mathematics**

| **Teaching methods in mathematics** | | **Frequency** | **Percent (%)** |
|---|---|---|---|
| **Lecture** | Yes | 2 | 8.3 |
| | No | 22 | 91.7 |
| **Problem solving** | Yes | 18 | 75.0 |
| | No | 6 | 25.0 |
| **Discussion** | Yes | 19 | 79.2 |
| | No | 5 | 20.8 |
| **Group work** | Yes | 17 | 70.8 |
| | No | 7 | 29.2 |

| | | | |
|---|---|---|---|
| **Individual work** | Yes | 12 | 50.0 |
| | No | 12 | 50.0 |
| **Discovery** | Yes | 8 | 33.3 |
| | No | 16 | 66.7 |
| **Demonstration** | Yes | 11 | 45.8 |
| | No | 13 | 54.2 |
| **Field trip** | No | 24 | 100.0 |
| **Teaching Aids** | Yes | 20 | 83 |
| | No | 4 | 17 |

The results show that majority of secondary teachers use the recommended effective methods of teaching mathematics indicated in the SMASSE Report (2005); problem solving (75%), discussion (79.2%) group work (70.8%) and use teaching aids (83%). However, discovery method which is central to creativity and innovation is used by minority (33.3%); Lack of opportunity for creativity in mathematics limits student to exploit innovative abilities. Ndiku et al (2012) support that mathematics form the basis of technological advancement as it predicts performance of other science subjects. Moreover Ominde Commission (1964) claimed that mathematics provides knowledge that would support people to become logical in thought and rational in decision making. Thus provision of creativity in mathematics through discovery method is an important instructional method.

Teachers were also asked to give their opinion on assessment of mathematics. The findings are represented in table 4.9

**Table 4.9: Assessment in Mathematics**

| **Assessment initiatives** | | **Frequency** | **Percent (%)** |
|---|---|---|---|
| **Frequency of giving home work** | **Everyday** | 22 | 91.7 |
| | **Weekly** | 2 | 8.3 |
| **Duration taken to mark homework** | **The following day** | 13 | 54.2 |
| | **After 2 days** | 1 | 4.2 |
| | **After a week** | 8 | 33.3 |

| | | | |
|---|---|---|---|
| | **Student exchange books** | 2 | 8.3 |
| **Test administration period** | **Weekly** | 3 | 12.5 |
| | **Fortnightly** | 12 | 50.0 |
| | **Monthly** | 9 | 37.5 |
| **Do you refer to KCPE Records** | **No** | 13 | 54. 8 |
| | **Yes** | 11 | 45.2 |

The data show that majority of teachers assess mathematics adequately**;** they give assignments every day (91.7%), mark by the following day (54.2%), give tests fortnightly (50%).The key to good performance is frequent assessment. Ndiku et al 2012 supports that schools that perform well in mathematics have frequent assessments and immediate feedback. However, only a minority refers to KCPE scores (45.2%). Reference to KCPE results may reveal entry behavior especially critical to individual attention of teachers. Obwoge (2013) points out that performance in KCSE can be improved if entry behavior posted in KCPE is considered.

### 4.5. Gender Differentiation in KCSE Performance

Gender differences in KCSE mathematics performance was examined using KCSE average result for three years (2012-2014). Mean and standard deviation, and independent t-test calculated and results presented in table 4.10 and 4.11

**Table 4.10: Mean Gender Differences in KCSE Mathematics Performance**

| | **Gender** | **N** | **Mean** | **Std. Deviation** | **Std. Error Mean** |
|---|---|---|---|---|---|
| **KCSE** | **Male** | 242 | 10.63 | 3.136 | .246 |
| | **Female** | 89 | 8.51 | 2.292 | .298 |

The results show that the mean for girls (8.51) is less than for boys (10.63). Thus the boys perform better than girls in mathematics. Further analysis using t-test in table 4.11 reveals that the difference in performance is significant (p=000). Thus, better performance in mathematics is not by chance.

**Table 4.11: Independent t- test on Gender Differences in Performance**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| kcse | Equal variances assumed | 1.028 | .312 | 4.750 | 219 | .000 | 2.121 | .447 | 1.241 | 3.001 |
| | Equal variances not assumed | | | 5.481 | 140.525 | .000 | 2.121 | .387 | 1.356 | 2.886 |

The findings are consistent with Elimu yetu coalition (2003) observation that there is a continued higher performance of boys over girls in mathematics and sciences. Similar findings have been reported in Nandi County (Ndiku, et al 2012) and Laikipia East (Mbacho et al, 2013). The findings also resonate with poor performance in mathematics among girls at national level recorded between 2012 to 2014 which is lower than boys' by aggregate three points (KNEC, 2015). Thus, the gender parity realized on enrolments in secondary education especially in central Kenya has not been resonated on quality front. Onsongo (2009) points out that poor performance of girls in sciences rocks out women in high profile careers such as ICT, engineering, actuarial science and medicine in higher education. More needs to be done to reverse the situation. Twoli (1998) argues that boys differed with girls on attitude, aspirations and achievement in science and mathematics, attributes that have to be cultivated among girls.

### 4.6 Students Attitude towards Mathematics

The fourth objective sought to examine student's attitudes towards mathematics. The attitude of students towards mathematics was measured by 5 items in a likert scale (Table 4.12).

**Table 4.12: Students Attitudes towards Mathematics**

| | Item | SD (%) | D (%) | N (%) | A (%) | SA (%) |
|---|---|---|---|---|---|---|
| **a.** | **Mathematics is one of the worst subjects.** | 3.6 | 1.8 | 6.3 | 17.9 | 70.5 |
| **b.** | **I am not good in mathematics** | 3.6 | 9.9 | 18.0 | 24.3 | 44.1 |
| **c.** | **I long for the day I will stop learning** | 5.4 | 7.1 | 5.4 | 17.0 | 65.2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **mathematics** | | | | | |
| **d.** | **Mathematics is difficult for me** | .9 | .9 | 14.4 | 27.0 | 56.8 |
| **e.** | **I need mathematics for my future career** | 9.9 | 3.6 | 1.8 | 21.6 | 63.1 |
| **f.** | **I am confident I can learn mathematics** | 3.6 | 2.7 | 4.5 | 20.7 | 68.5 |
| **g.** | **I can handle most subjects but not mathematics** | 9.8 | 3.6 | 5.4 | 21.4 | 59.8 |
| **h.** | **I will not need mathematics when I get out of school** | 7.1 | 6.3 | 2.7 | 11.6 | 72.3 |
| **i.** | **I like doing mathematics** | 5.5 | 6.4 | 10.9 | 37.3 | 40.0 |
| **j.** | **I get good grades in mathematics** | 6.3 | 17.1 | 26.1 | 24.3 | 26.1 |
| **k.** | **Mathematics is an easy subject to learn** | 5.6 | 3.7 | 15.7 | 28.7 | 46.3 |
| **l.** | **Mathematics is an important subject to learn** | 9.2 | 1.8 | 1.8 | 22.9 | 64.2 |
| **m.** | **I don't like my mathematics teacher** | 8.3 | 5.5 | 4.6 | 11.9 | 69.7 |
| **n.** | **I use mathematics supplementary books** | 9.2 | 7.3 | 13.8 | 39.4 | 30.3 |
| **o.** | **I often practice mathematics during my free time** | 9.4 | 9.4 | 23.6 | 31.1 | 26.4 |
| **p.** | **I'm not able to complete my mathematics assignment in time** | 9.9 | 8.1 | 15.3 | 30.6 | 36.0 |
| **q.** | **I dislike answering individual questions** | 6.4 | 11.9 | 14.7 | 22.0 | 45.0 |
| **r.** | **Mathematics should continue to be a compulsory subject** | 10.9 | 4.5 | 8.2 | 20.9 | 55.5 |
| **s.** | **I have desire to pursue mathematics to higher levels** | 18.2 | 11.8 | 15.5 | 20.0 | 34.5 |
| **t.** | **Mathematics lessons should be more per week** | 16.2 | 7.2 | 16.2 | 26.1 | 34.2 |

The scores were recorded as follows; strongly agree (5), agree (4), unsure (3), disagree (2) and strongly disagree (1).The maximum possible mean score was 5 while

the minimum possible mean score was 1. Eleven items were positively keyed while items1, 2, 3, 4, 7, 8, 16 and 17 were negatively keyed and were hence reversed prior to the analysis. As such a high score indicates a positive attitude. Mean and standard deviation was represented in table 4.13.

**Table 4.13: Mean and Standard Deviation on Attitudes towards Mathematics**

| Mean | N | Std. Deviation |
|---|---|---|
| **68.22** | 93 | 11.040 |

The means were rated according to the following scale; 20-29- negative attitude, 40-59-, slightly negative, 60-79- slightly positive and 80-99 positive. The mean was 68.22 percent which represented slightly positive attitude. The findings are consistent with Mutai (2010) who reported positive attitude towards mathematics among students in Bureti District. Perhaps intervention measures such as inservice programs as well recruitment of young energetic teachers may have provided incentives to students to develop positive attitudes. The various attitudes formed by students as they interact in school, can determine how they learn mathematics. Consequently, this determines their achievement in secondary school mathematics examinations. Nevertheless, among the minority (8.1%) of students who reported that they dislike mathematics, majority (60%) attributed it to the perceived difficulty of the subject (Table 4.14 & 4.15).

**Table 4.14: Mathematics Like and Dislike**

| | Frequency | Valid Percent |
|---|---|---|
| Yes | 102 | 91.9 |
| No | 9 | 8.1 |
| **Total** | **111** | **100.0** |

**Table 4.15: Reasons for Dislike of Mathematics**

| Reasons mathematics for dislike of | Percent (%) |
|---|---|
| Difficult | 60.0 |
| Boring teacher | 20.0 |
| Others | 20.0 |
| **Total** | **100.0** |

When students view subjects as difficult they often lose hope and seldom put effort in it. According to UNESCO (2013) poor performance in mathematics is an issue of perception. The author places a heavier responsibility to the teachers to cultivate positive perception among students especially in sciences and mathematics.

# CHAPTER FIVE

# SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

## 5.1 Introduction

This chapter presents a summary of the research findings, the conclusion, recommendations and suggestions for further research as observed by the researcher during the study

## 5.2 Summary of Findings of the Study

In this section, objectives are restated and linked with findings. The purpose of the study was to examine the predictive validity of KCPE to the KCSE performance in mathematics. The study was guided by the following specific objectives.

i. To determine the predictive validity of performance in KCPE mathematics for the years 2008 to 2010 on their performance in KCSE mathematics over the period 2012 to 2014.
ii. To identify how the skills and abilities tested in mathematics at the KCPE and KCSE examination papers compare
iii. To find out gender differentiation in performance in mathematics at KCSE among students
iv. To assess the attitudes of students towards mathematics

### 5.2.1 Predictive Validity of Performance in KCPE Mathematics on the Performance in KCSE Mathematics

Mean differences occur in the performance between KCPE performance (9.7) and KCSE performance (10.05) in mathematics. Paired t test analysis indicated a significant mean difference at 0.05 confidence level ($p<0.05$). Pearson correlation reveal strong and positive correlation ($r=.747$) occurs between the performance in the two examinations. Linear regression reveals a predictive validity of 55.6% which according to F test is significant ($F(1)217) = 4.233$; $p<0.05$).

### 5.2.2 Comparison of Skills and Abilities tested in Mathematics in KCPE and KCSE

Review of syllabus indicate that both mathematic curriculum capture blooms taxonomy; knowledge, comprehension application, analysis and application. Moreover, the content skill at KCSE level are derived from the core topics in primary mathematics with additional and upgraded content scope necessary for the students' progression in conformity with their maturation and abstraction. Both syllabuses constitute teaching and learning activities which include exercises, projects and instructional demonstrations and problem solving. However, majority differences occur in nature of marking and methods of teaching. Majority of secondary teachers use the recommended effective methods of teaching mathematics indicated in the SMASSE Report (2005); problem solving (75%), discussion (79.2%) group work (70.8%) and use teaching aids (83%). However, discovery method which is central to creativity and innovation is used by minority (33. majority of teachers assess mathematics adequately**;** they give assignments every day (91.7%), mark by the following day (54.2%) give tests fortnightly (50%). However, only a minority refers to KCPE scores (45.2%).

### 5.2.3. Gender Differentiation in KCSE Performance

The mean for girls (8.51) is less than for boys (10.63) in the study period. Independent t-test analysis reveals that the difference in performance is significant (p=000).Thus, the gender parity realized on enrolments in secondary education especially in central Kenya has not been resonated on quality front. Girls have been reported to have poorer attitudes and lower aspirations in mathematics and sciences.

### 5.2.4 Students Attitude towards Mathematics

The mean was 68.22 percent which represented slightly positive attitude. Nevertheless, among the minority (8.1%) of students who reported that they dislike mathematics, majority of them (60%) attributed it to the perceived difficulty of the subject. When students view subjects as difficult they often lose hope and seldom put effort in it.

## 5.3 Conclusions

i. KCPE performance in mathematics predicts performance in KCSE mathematics at 55.6%

ii. In both examinations skills and abilities tested reflect blooms taxonomy, syllabus recommend suitable teaching methodologies. At secondary school level, teachers use recommended teaching methods at instructional level apart from discovery method. Moreover, teachers provide adequate mathematic assessments. However, differences occur in marking and instructional practices at classroom level.

iii. Girls performance in mathematics is still lower compared to boys .Gender parity achieved in enrollments in secondary education especially in Central Kenya have not been resonated on quality front.

iv. Attitude towards mathematics is slightly positive but majority of minority students who dislike mathematics view as a difficult subjects

## 5.4 Recommendations

The study findings recommend that; teachers in secondary schools should use KCPE performance as a measure of entry behavior especially in the consideration of individual differences in classroom instruction, the Education Standards and Quality Assurance Council should ensure that the recommended teaching methodologies are used in primary schools to bridge the perceived disconnect between the two levels in teaching of mathematics to boost their relationship, The KICD should as much as possible ensure primary school mathematics content, learning experiences and teaching methodology adequately forms the foundations of concepts taught in secondary school in the impending curriculum reform, CEMASTECEA should particularly target the newly recruited teachers who form majority of mathematics for the in-service courses to improve their pedagogical skills. Finally, the MOE, School administrators and parents should in conjunction provide incentives to girls to boost their performance in mathematics.

## 5.5 Areas for Further Research

i. A study should be done to examine influence of teaching methodologies on performance in KCPE and KCSE mathematics

ii. A study should be done on role of gender socialization and performance in mathematics

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## APPENDIX I: QUESTIONNAIRE FOR FORM 3 STUDENTS

**Demographic information**

Please tick where appropriate

1) Gender: Male ( ) Female ( )

2) Age: 10yrs to 14yrs ( ) 15 and above ( )

**Students' attitude towards mathematics**

3) Do you like mathematics?

……

4) If the answer to (3) above is No, state reasons.

……

……

5) If the answer to (3) above is Yes, state reasons.

……

……

……

6) Does the school provide you with mathematics text books?

…….

7) Does the school provide you with other mathematics reference books kept in the library? …….

8) Who buys text books you use in mathematics?

……

……

9) How often do you practice mathematics during preps in a week?

……..…

10) Do you like your mathematics teacher?

…….

11) Do you like the way the teacher teaches?

……..

12) Does your mathematics teacher give you assignments? How often?

…….

13) Does your teacher mark all the assignments in time? Does he/she revise the work with you after marking?

……..……

…….……

14) Does your teacher attempt to link what you learn in mathematics with real life?

Please indicate your level of agreement with each of the following items: Strongly disagree (SD), Disagree (D), Neutral (N), Agree (A), Strongly Agree (SA)

(Tick where appropriate)

| a. | ITEM | **SD** | **D** | **N** | **A** | **SA** |
|---|---|---|---|---|---|---|
| b. | Mathematics is one of the worst subjects. | | | | | |
| c. | I am not good in mathematics | | | | | |
| d. | I long for the day I will stop learning mathematics | | | | | |
| e. | Mathematics is difficult for me | | | | | |
| f. | I need mathematics for my future career | | | | | |
| g. | I am confident I can learn mathematics | | | | | |
| h. | I can handle most subjects but not mathematics | | | | | |
| i. | I will not need mathematics when I get out of school | | | | | |
| j. | I like doing mathematics | | | | | |
| k. | I get good grades in mathematics | | | | | |
| l. | Mathematics is an easy subject to learn | | | | | |
| m. | Mathematics is an important subject to learn | | | | | |
| n. | I don't like my mathematics teacher | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| o. | I use mathematics supplementary books | | | | | |
| p. | I often practice mathematics during my free time | | | | | |
| q. | I’m not able to complete my mathematics assignment in time | | | | | |
| r. | I dislike answering individual questions | | | | | |
| s. | Mathematics should continue to be a compulsory subject | | | | | |
| t. | I have a desire to pursue mathematics to higher levels | | | | | |
| u. | Mathematics lessons should be more per week | | | | | |

## APPENDIX 11: QUESTIONNAIRE FOR TEACHERS

**Demographic Information**

1) Age Below 20 years ( ) 21-35 years ( )
36-50 years ( ) 51-60 years ( )
Above 60 years ( )

2) Gender

Male ( ) Female ( )

3) Qualification

B/ED ( ) BSc/BA ( )

Diploma ( )

Others, specify……

4) Teaching Experience

Over 12 years ( ) 8-11 years ( )

3-7 years ( ) 0-2 years ( )

5) What is your workload per week?

Below 15 periods ( ) 15-22 periods per week ( )
23-27 periods per week ( ) 28 periods per week ( )

6) Are you teaching other subjects apart from mathematics?

Yes ( ) No ( )

7) What other subjects?

Physics ( ) Biology ( )
Chemistry ( ) Geography ( )
Other specify…….

8) How many periods in other subjects?

| | |
|---|---|
| 12 periods and above | ( ) |
| 8-11 | ( ) |
| 5-7 | ( ) |
| Below 4 | ( ) |

9) Do you use teaching aids to tech mathematics?

Yes ( ) No ( )

10) What are some of the teaching aids that you use?

| | | | |
|---|---|---|---|
| Charts | ( ) | Geometry instrument | ( ) |
| Models | ( ) | Probability kit | ( ) |

Others specify……

11) What method do you use in teaching mathematics?

| | | | |
|---|---|---|---|
| Lecture | ( ) | Problem solving | ( ) |
| Use of example | ( ) | Discussion | ( ) |
| Group work | ( ) | Individual work | ( ) |
| Discovery | ( ) | Demonstration | ( ) |
| Field trips | ( ) | Programmed learning | ( ) |
| Questioning technique | ( ) | Seminars | ( ) |

Others specify……

12) How often do you give homework to your students?

| | | | |
|---|---|---|---|
| Every day | ( ) | After two days | ( ) |
| After the topic is over | ( ) | Weekly | ( ) |

13) After how long do you give the marked homework to the students?

| | | | |
|---|---|---|---|
| The following day | ( ) | After two days | ( ) |
| After a week | ( ) | Students exchange books for marking | ( ) |

14) How long do you administer tests?

| | | | |
|---|---|---|---|
| Weekly | ( ) | Fortnightly | ( ) |
| After three days | ( ) | Monthly | ( ) |

15) Where do you enter the scores after marking?

| | | | |
|---|---|---|---|
| Class progress record | ( ) | Class list | ( ) |
| A prepared book | ( ) | In an exercise book | ( ) |

16) Do you have a record as to how your students had scored at KCPE in mathematics?

Yes ( ) No ( )

How well was this grade…….

17) Does this grade agree with student's progress?

Strongly agree ( )

Agree ( )

Undecided ( )

Disagree ( )

Strongly disagree ( )

18) Why do you think there is a difference between the KCPE grade and the progress records of students?

Methods of teaching ( )

Nature of marking ( )

Students tax ( )

I have no idea ( )

19) Do you have a session to discuss individual performance with weak students?

Yes ( ) No ( )

20) How often do you discuss progress?

| | | | |
|---|---|---|---|
| Quite often | ( ) | Often | ( ) |
| Occasionally | ( ) | Not at all | ( ) |

21) Do you associate mathematics to real life experiences while teaching?

| | | | |
|---|---|---|---|
| Quite often | ( ) | Often | ( ) |
| Rarely | ( ) | Not at all | ( ) |

22. Do you discuss with your students about job opportunities visa-vis the quality of mathematics grade?

| | | | |
|---|---|---|---|
| Quite often | ( ) | Much | ( ) |
| Not much | ( ) | Not at all | ( ) |

23. How much do you like teaching maths?

| | | | |
|---|---|---|---|
| Very much | ( ) | Much | ( ) |
| Not much | ( ) | Not at all | ( ) |

24. What makes you enjoy teaching mathematics?

| | | | |
|---|---|---|---|
| It is interesting | ( ) | Liked by students | ( ) |
| Easy to teach | ( ) | Requires less preparation | ( ) |

25. What is the general attitude of students you teach towards mathematics?

| | | | |
|---|---|---|---|
| Very interested | ( ) | Interested | ( ) |
| Fairly interested | ( ) | Not interested | ( ) |

26. How much do you agree with the following statement?

Use only one of the following: Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (D) or Strongly Disagree (SD) for each response

| | Statements | SA | A | UD | D | SD |
|---|---|---|---|---|---|---|
| a | Students are well in learning mathematics | | | | | |
| b | KCSE mathematics is too wide to cover in 4years | | | | | |
| c | Some topics are too hard for students to comprehend | | | | | |
| d | The school has enough textbooks | | | | | |
| e | Teachers are well motivated to teach mathematics | | | | | |
| f | The students are well graded and counseled mathematics | | | | | |
| g | Teachers prefer teaching mathematics in the afternoon | | | | | |
| h | The head teachers gives adequate support for teaching of mathematics | | | | | |
| i | Students are not influenced by bad behavior practices e.g. drugs | | | | | |
| j | There is seriousness in learning mathematics in the school | | | | | |

## APPENDIX III: KCSE AND KCPE SYLLABUS

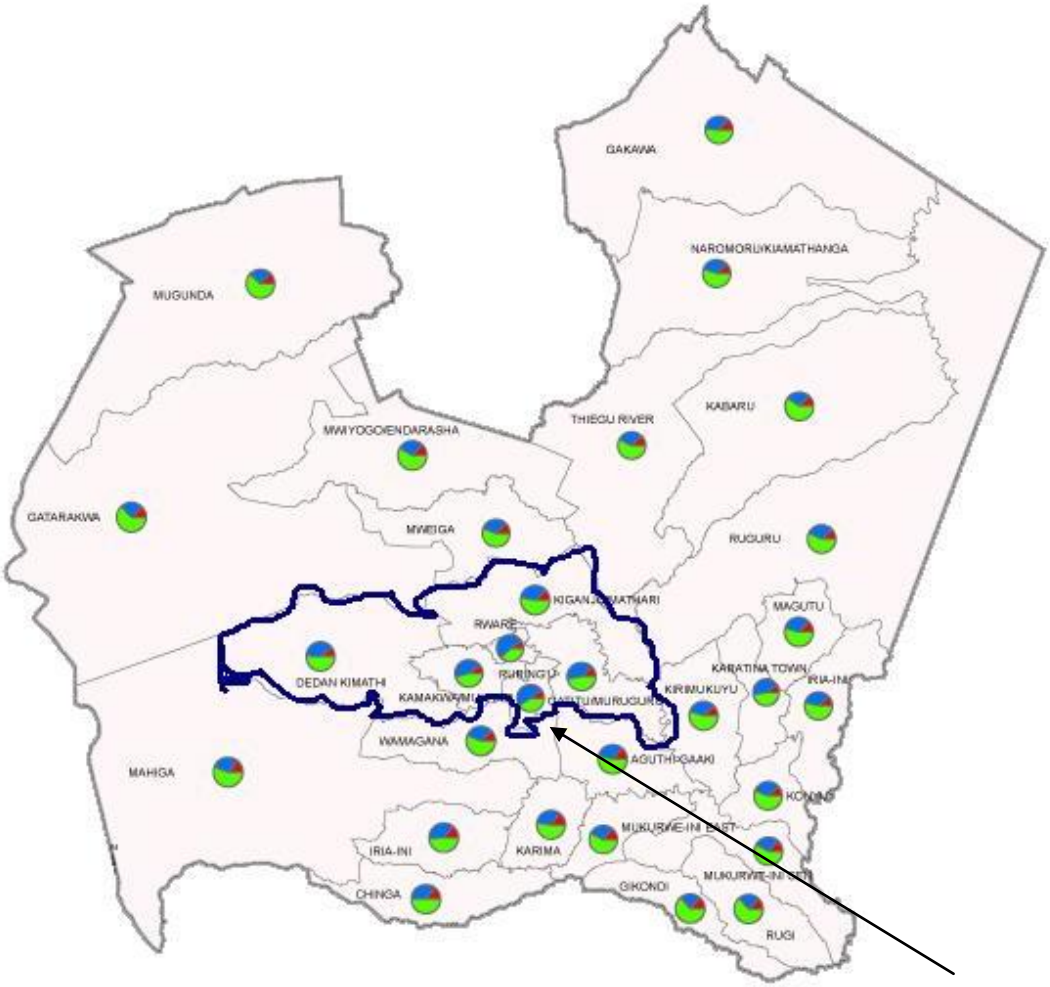
PART 1: KCPE MATHEMATICS SYLLABUS

- Whole numbers up to millions
- Operations on whole numbers
- Measurements:-Length, capacity, mass, money, time, area, volume, speed and temperature
- Geometry
- Fractions, decimals, percentages
- Algebra
- Tables and graphs
- Scale drawing
- Ratio and proportion

PART 2: KCSE MATHEMATICS SYLLABUS

- Numbers
- Measurements
- Algebra
- Geometry
- Graphs
- Trigonometry
- Commercial arithmetic
- Probability and statistics
- Vectors
- Transformations
- Matrices
- Navigation
- Linear programming
- Area approximation
- Elementary calculus

## APPENDIX IV: NYERI TOWN SUBCOUNTY MAP




Borders enclosed-Nyeri Town Sub-County

## APPENDIX V: RESEARCH AUTHORIZATION


**NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION**

Telephone: +254-20-2213471,
2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No.

Date:

**23rd October, 2015**

**NACOSTI/P/15/87232/8436**

Eunice Wairimu Ndegwa
University of Nairobi
P.O. Box 30197-00100
**NAIROBI.**

**RE: RESEARCH AUTHORIZATION**

Following your application for authority to carry out research on ***"Extent to which performance of Mathematics in Kenya Certificate of Primary Education predict performance of Mathematics in Kenya Certificate Of Secondary Education in Nyeri Central Sub County,"*** I am pleased to inform you that you have been authorized to undertake research in **Nyeri County** for a period ending **23rd October, 2016.**

You are advised to report to **the County Commissioner and the County Director of Education, Nyeri County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

**SAID HUSSEIN**
**FOR: DIRECTOR GENERAL/CEO**

Copy to:

The County Commissioner
Nyeri County.

The County Director of Education
Nyeri County.

## APPENDIX VI: RESEARCH PERMIT

THIS IS TO CERTIFY THAT:
*MS. EUNICE WAIRIMU NDEGWA*
of UNIVERSITY OF NAIROBI, 575-10100
Nyeri,has been permitted to conduct
research in *Nyeri County*

on the topic: *EXTENT TO WHICH PERFORMANCE OF MATHEMATICS IN KENYA CERTIFICATE OF PRIMARY EDUCATION PREDICT PERFORMANCE OF MATHEMATICS IN KENYA CERTIFICATE OF SECONDARY EDUCATION IN NYERI CENTRAL SUB COUNTY.*

for the period ending:
*23rd October,2016*

Permit No : NACOSTI/P/15/87232/8436
Date Of Issue : 23rd October,2015
Fee Recieved :Ksh 1000

.....
*Applicant's*
*Signature*

.....
*Director General*
*National Commission for Science,*
*Technology & Innovation*

CONDITIONS

1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit
2. Government Officers will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice

REPUBLIC OF KENYA

NACOSTI

National Commission for Science,
Technology and Innovation

RESEARCH CLEARANCE
PERMIT

Serial No. A 6923

CONDITIONS: see back page